



Chapter 10 - Intake of Fish and Shellfish

Both meals eaten at home and away from home were recorded. The amount of fish prepared was determined as follows (Javitz, 1980): "For fresh fish, the weight was recorded in ounces and may have included the weight of the head and tail. For frozen fish, the weight was recorded in packaged ounces, and it was noted whether the fish was breaded or combined with other ingredients (e.g., TV dinners). For canned fish, the weight was recorded in packaged ounces and it was noted whether the fish was canned in water, oil, or with other ingredients (e.g., soups)".

Javitz (1980) reported that the corrected survey tapes contained data on 24,652 individuals who consumed fish in the survey month and that tabulations performed by NPD indicated that these fish consumers represented 94 percent of the U.S. population. For this population of "fish consumers", Javitz (1980) calculated means and percentiles of fish consumption by demographic variables (age, sex, race, census region and community type) and overall (Tables 10-1 through 10-4). The overall mean fish intake rate among fish consumers was calculated at 14.3 g/day and the 95th percentile at 41.7 g/day.

As seen in Table 10-1, the mean and 95th percentile of fish consumption were higher for Asian-Americans as compared to the other racial groups. Other differences in intake rates are those between gender and age groups. While males (15.6 g/d) eat slightly more fish than females (13.2 g/d), and adults eat more fish than children, the corresponding differences in body weight would probably compensate for the different intake rates in exposure calculations (Javitz, 1980). There appeared to be no large differences in regional intake rates, although higher rates are shown in the New England and Middle Atlantic census regions. *

The mean and 95th percentile intake rates by age-gender groups are presented in Table 10-2. Tables 10-3 and 10-4 present the distribution of fish consumption for females and males, respectively, by age; these tables give the percentages of females/males in a given age bracket with intake rates within various ranges. Table 10-5 presents mean total fish consumption by fish species.

The TRI survey data were also utilized by Rupp et al. (1980) to generate fish intake distributions for three age groups (<11, 12-18, and 19+ years) within each of the 9 census regions and for the entire United States. Separate distributions were derived for freshwater finfish, saltwater finfish and shellfish; thus, a total of 90 (3*3*10) different distributions were derived, each corresponding to intake of a specific category of fish for a given age group within a given region. The analysis of Rupp et al. (1980) included only those respondents with known age. This amounted to 23,213 respondents.

Ruffle et al. (1994) used the percentiles data of Rupp et al. (1980) to estimate the best fitting lognormal parameters for each distribution. Three methods (non-linear optimization, first probability plot and second probability plot) were used to estimate

**Risk Assessment
Guidance for Superfund
Volume I
Human Health Evaluation Manual
(Part A)**

Interim Final

Office of Emergency and Remedial Response
U.S. Environmental Protection Agency
Washington, DC 20450

EXHIBIT 6-17

RESIDENTIAL EXPOSURE: FOOD PATHWAY --
INGESTION OF CONTAMINATED FISH AND SHELLFISH^a

Equation:

$$\text{Intake (mg/kg-day)} = \frac{\text{CF} \times \text{IR} \times \text{FI} \times \text{EF} \times \text{ED}}{\text{BW} \times \text{AT}}$$

Where:

- CF = Contaminant Concentration in Fish (mg/kg)
 IR = Ingestion Rate (kg/meal)
 FI = Fraction Ingested from Contaminated Source (unitless)
 EF = Exposure Frequency (meals/year)
 ED = Exposure Duration (years)
 BW = Body Weight (kg)
 AT = Averaging Time (period over which exposure is averaged — days)

Variable Values:

CF: Site-specific measured or modeled value

IR: 0.284 kg/meal (95th percentile for fin fish; Pao *et al.* 1982)
 0.113 kg/meal (50th percentile for fin fish; Pao *et al.* 1982)

132 g/day (95th percentile daily intakes averaged over three days
 for consumers of fin fish; Pao *et al.* 1982)

38 g/day (50th percentile daily intake, averaged over three days
 for consumers of fin fish; Pao *et al.* 1982)

6.5 g/day (daily intake averaged over a year; EPA 1989d.

NOTE: Daily intake values should be used in conjunction with
 an exposure frequency of 365 days/year.)

Specific values for age, sex, race, region and fish species are
 available (EPA 1989d, 1989h)

FI: Pathway-specific value (should consider local usage patterns)

EF: Pathway-specific value (should consider local population patterns
 if information is available)

48 days/year (average per capita for fish and shellfish; EPA Tolerance
 Assessment System in EPA 1989h)

ED: 70 years (lifetime; by convention)

30 years (national upper-bound time (90th percentile) at one residence;
 EPA 1989d)

9 years (national median time (50th percentile) at one residence;
 EPA 1989d)

BW: 70 kg (adult, average; EPA 1989d)

Age-specific values (EPA 1985a, 1989d)

AT: Pathway-specific period of exposure for noncarcinogenic effects

(i.e., ED x 365 days/year), and 70 year lifetime for carcinogenic effects
 (i.e., 70 years x 365 days/year).

^a See Section 6.4.1 and 6.6.4 for a discussion of which variable values should be used to calculate the reasonable maximum exposure. In general, use 95th or 90th percentile values for intake rate and exposure frequency and duration variables.